

What is Claimed is:

1. A method of emulating a desired waveform, comprising:
 - producing a time profile of said desired waveform characterized by a plurality of sample values;
 - generating a plurality of RF waveforms, each RF waveform of said plurality of RF
- 5 waveforms having energy scaled in accordance with a corresponding one of the plurality of sample values of said time profile.
2. The method of claim 1, wherein said plurality of RF waveforms are generated in accordance with a timing of a plurality of samples corresponding to said plurality of sample values.
3. The method of claim 1, wherein the energy of each generated RF waveform is scaled by at least one of patterning, making, regulating, setting, or estimating according to a corresponding sample value one of the plurality of sample values relative to a reference value.
4. The method of claim 2, wherein the reference value is a maximum sample value of the plurality of sample values.
5. The method of claim 1, wherein at least one of amplitude, width or type of each RF waveform of said plurality of RF waveforms is determined in accordance with a corresponding one of said plurality of sample values.

6. The method of claim 1, wherein the amplitude comprises root mean squared (RMS) amplitude.
7. The method of claim 3, wherein the type of each RF waveform comprises at least one of a wavelet, an impulse, gaussian pulse, doublet pulse, triplet pulse, step pulse, triangle pulse, sawtooth pulse, or burst of cycles.
8. The method of claim 1, wherein said time profile corresponds to a desired frequency profile.
9. The method of claim 8, wherein the desired frequency profile corresponds to a notch, a spike, a roll off, or a frequency mask within a frequency band of interest.
10. The method of claim 1, wherein each RF waveform of the plurality of RF waveforms has a bandwidth that spans a frequency band of interest.
11. The method of claim 1, further comprising:
 limiting an aggregate energy spectra of the plurality of RF waveforms to a frequency band of interest.
12. The method of claim 1, further comprising:
 limiting an aggregate energy spectra of the plurality of RF waveforms to select at least one harmonic of a plurality of harmonics of a desired signal.

13. The method of claim 12, wherein said one or more harmonics correspond to one or more communications channels.
14. The method of claim 12, wherein said one or more harmonics are selected in accordance with a code that defines a communications channel.
15. The method of claim 1, further comprising filtering an aggregate energy spectra of the plurality of RF waveforms in accordance with a code.
16. The method of claim 1, further comprising modulating the plurality of RF waveforms in accordance with an information signal.
17. The method of claim 1, wherein the plurality of RF waveforms are generated in one or more groups, each group of the one or more groups comprising two or more RF waveforms having a predefined time spacing.
18. The method of claim 17, wherein at least one RF waveform of each group is inverted.
19. The method of claim 18, wherein the predefined time spacing corresponds to one fourth of the period of a frequency of an eliminated fold image.
20. The method of claim 1, wherein a polarity of each RF waveform of said plurality of RF waveforms is in accordance with a polarity of a corresponding one of the plurality of sample values of said time profile.

21. The method of claim 2, wherein the time spacing between the plurality of RF waveforms corresponds to the time spacing between the plurality of samples.
22. The method of claim 2, wherein the time spacing of the plurality of samples is substantially equal corresponding to a generation rate of the plurality of RF waveforms.
23. The method of claim 22, wherein the generation rate corresponds to a desired center frequency within a frequency band of interest.
24. The method of claim 22, wherein the generation rate is programmable.
25. The method of claim 2, further comprising:
dithering the timing of each RF waveform of the plurality of RF waveforms to suppress at least one harmonic within a frequency band of interest.
26. The method of claim 25, wherein the timing of each RF waveform is dithered pseudorandomly.
27. The method of claim 25, wherein the timing of each RF waveform is dithered in accordance with a code.
28. The method of claim 2, wherein the timing of the plurality of samples corresponds to a Nyquist sampling rate at a frequency within a frequency band of interest.

29. The method of claim 2, wherein the timing of the plurality of samples corresponds to a sampling rate that is greater than a Nyquist sampling rate at a frequency within a frequency band of interest.
30. The method of claim 2, wherein the timing of the plurality of samples corresponds to a sampling rate that is less than a Nyquist sampling rate at a frequency within a frequency band of interest.
31. The method of claim 1, wherein the time profile corresponds to the time profile of an enveloped sine wave signal.
32. The method of claim 31, wherein the carrier frequency of the enveloped sine wave signal corresponds to a center frequency within a frequency band of interest.
33. The method of claim 31, wherein the enveloped sine wave signal has an envelope shape comprising at least one of a cosine, raised cosine, trapezoid, and rectangle.
34. The method of claim 1, wherein the time profile is programmable.
35. The method of claim 34, wherein the peak amplitude of the time profile is programmable.
36. The method of claim 1, wherein the time profile is in accordance with a shifted average DC level of the desired waveform.

37. The method of claim 36, wherein the shifted average DC level is shifted such that each of the plurality of samples has the same polarity.
38. The method of claim 36, further comprising removing a DC component from an aggregate RF energy spectra.
39. The method of claim 1, wherein the time profile of the desired waveform corresponds to a composite profile of a plurality of orthogonal waveforms.
40. The method of claim 39, wherein the plurality of orthogonal waveforms are orthogonal when arriving at different times at a receiver.
41. The method of claim 39, wherein each orthogonal waveform of the plurality of orthogonal waveforms has the same power spectral density profile, and wherein the plurality of orthogonal waveforms have phase profiles across a frequency span causing the plurality of orthogonal waveforms to be orthogonal.
42. The method of claim 41, wherein the phase of a first orthogonal waveform of the plurality of orthogonal waveforms corresponds to the phase of a second orthogonal waveform of the plurality of orthogonal waveforms rotated an even multiple of 2π radians across its bandwidth.
43. The method of claim 38, wherein the plurality of orthogonal waveforms have phase shifts in accordance with a plurality of Walsh functions.

44. The method of claim 43, wherein the plurality of orthogonal waveforms comprises n orthogonal waveforms phase shifted by 0 or π radians in accordance with a plurality of n -bit Walsh functions.
45. The method of claim 39, wherein a first orthogonal waveform of the plurality of orthogonal waveforms is the Hilbert transform of a second orthogonal waveform of the plurality of orthogonal waveforms.
46. The method of claim 39, wherein each orthogonal waveform of the plurality of orthogonal waveforms is an n^{th} order derivative of a first orthogonal waveform of the plurality of orthogonal waveforms.
47. The method of claim 1, wherein the desired waveform is modulated by an information signal.
48. The method of claim 1, wherein the desired waveform is in accordance with a code.
49. The method of claim 1, wherein the duration of the time profile corresponds to a bandwidth of the desired waveform.
50. The method of claim 1, wherein the duration of the time profile corresponds to a bandwidth of each harmonic of a plurality of harmonics.
51. The method of claim 1, wherein the time profile corresponds to that of at least one of a time limited desired waveform and a frequency limited desired waveform.

52. The method of claim 1, wherein the time profile is produced by an inverse Fourier transformation of a frequency profile of the desired waveform.
53. The method of claim 52, wherein the frequency profile is produced by a Fourier transformation of a vector amplitude profile of the desired waveform.
54. The method of claim 53, wherein the vector amplitude profile comprises x, y, z, t, amplitude, and vector polarization angle parameters, wherein x, y, and z correspond to location coordinates, and wherein one or more parameters of said x, y, z, t, amplitude, and vector polarization angle parameters is maintained constant to define at least one of signal
5. amplitude and polarization at one of a point, line, plane, and surface in space over time relative to a position
55. The method of claim 54, wherein the position is a transmit antenna position.
56. The method of claim 1, wherein the time profile is defined by frequency, phase, and amplitude parameters, wherein at least one of the amplitude parameter and phase parameter is maintained constant over a specified bandwidth.
57. The method of claim 1, wherein the plurality of RF waveforms have substantially the same amplitude, and wherein the widths of the plurality of RF waveforms are scaled.

58. The method of claim 1, wherein the plurality of RF waveforms have substantially the same width, and wherein the amplitudes of the plurality of RF waveforms are scaled.
59. The method of claim 1, wherein at least one of a width and an amplitude of each RF waveform of the plurality of RF waveforms is scaled.
60. The method of claim 1, wherein each of said plurality of RF waveforms is separately generated.
61. The method of claim 1, wherein each RF waveform of the plurality of RF waveforms is scaled to maintain a defined amplitude/width ratio.
62. The method of claim 1, wherein the plurality of RF waveforms comprise at least one of a plurality of digital waveforms and a plurality of analog waveforms.
63. The method of claim 62, wherein the plurality of analog waveforms are generated in response to one or more digital signals of a plurality of digital signals that correspond to the plurality of sample values.
64. The method of claim 63, wherein the plurality of digital signals are stored in a memory.
65. A method for generating waveforms, comprising:
generating a plurality of RF waveforms at a waveform generation rate; and

modulating the plurality of RF waveforms in accordance with samples of a time profile of a prototype signal to produce an aggregate RF energy that approximates the RF energy of the prototype signal.

66. The method of claim 65 further comprising limiting the aggregate RF energy to a frequency band of interest.

67. The method of claim 65, wherein the plurality of RF waveforms are modulated by at least one of amplitude modulation and width modulation.

68. The method of claim 65, wherein the waveform generation rate is selected in accordance with a center frequency within a frequency band of interest.

69. The method of claim 65, wherein the waveform generation rate is selected to place a fold image outside of a frequency band of interest.

70. The method of claim 65, wherein the waveform generation rate corresponds to a rate that is at least twice a selected frequency within a frequency band of interest.

71. The method of claim 65, wherein the waveform generation rate corresponds to a rate that is less than twice a selected frequency within a frequency band of interest.

72. The method of claim 65, further comprising:

generating a first plurality of RF waveforms in accordance with corresponding samples of the time profile; and

generating a second plurality of RF waveforms in accordance with corresponding samples
5 of the time profile, wherein there is a defined time spacing between each of the second
plurality of RF waveforms and a corresponding one of the first plurality of RF waveforms.

73. The method of claim 72, wherein the defined time spacing corresponds substantially to
one fourth of a rate at which both the first plurality of RF waveforms and second plurality
of RF waveforms are generated.

74. The method of claim 65, wherein the plurality of RF waveforms is amplitude modulated
in accordance with the samples.

75. The method of claim 65, further comprising:
separately generating a plurality of variable amplitude RF waveforms.

76. The method of claim 75, further comprising:
digitally representing each of the plurality of variable amplitude RF waveforms in terms
of quantized amplitude representations.

77. The method of claim 76, further comprising:
storing the quantized amplitude representations in a memory.

78. The method of claim 77, further comprising:
retrieving said quantized amplitude representations from the memory and applying them
to a digital to analog converter.

79. The method of claim 65, wherein each RF waveform of the plurality of RF waveforms comprises one of an impulse, gaussian pulse, doublet pulse, triplet pulse, step pulse, triangle pulse, sawtooth pulse, and burst of cycles.
80. The method of claim 65, wherein the time spacing between each of said plurality of RF waveforms is substantially the same.
81. The method of claim 83, wherein the time spacing corresponds to a center frequency of the aggregate RF energy.
82. The method of claim 65, wherein the width and shape of the time profile determines the bandwidth of each of a plurality of harmonics of the spectra of the plurality of RF waveforms.
83. The method of claim 65, wherein the aggregate RF energy of the plurality of RF waveforms is limited to a harmonic of a plurality of harmonics of a desired signal.
84. A waveform generator, comprising:
- a signal generator that generates a plurality of RF waveforms at a waveform generation rate, each of said plurality of RF waveforms having an amplitude scaled in accordance with a desired envelope; and
- 5 a filter that limits the aggregate RF energy of the plurality of RF waveforms to within a frequency band of interest.

85. The waveform generator of claim 84, wherein the waveform generation rate is selected in accordance with the frequency band of interest.

86. The waveform generator of claim 84, wherein the waveform generation rate is selected to place a fold image outside of the frequency band of interest.

87. The waveform generator of claim 84, wherein the waveform generation rate corresponds to a rate that is at least twice a selected frequency within the frequency band of interest.

88. The waveform generator of claim 84, wherein the waveform generation rate corresponds to a rate that is less than twice a selected frequency within the frequency band of interest.

89. The waveform generator of claim 84, wherein the signal generator includes:

a first signal generator that generates a first plurality of RF waveforms having amplitudes modulated in accordance with the desired envelope;

a second signal generator that generates a second plurality of RF waveforms having amplitudes modulated in accordance with the desired envelope, wherein there is a defined time spacing between each of the second plurality of RF waveforms and a corresponding one of the first plurality of RF waveforms.

90. The waveform generator of claim 89, wherein the defined time spacing corresponds substantially to one fourth of a rate at which both the first plurality of RF waveforms and second plurality of RF waveforms are generated.

91. The waveform generator of claim 84, wherein said signal generator includes a constant amplitude signal generator that generates a plurality of constant amplitude signals, and an amplitude modulator that modulates the plurality of constant amplitude signals to produce the plurality of RF waveforms.
92. The waveform generator of claim 84, wherein said signal generator includes a variable amplitude signal generator that separately generates each of said plurality of RF waveforms.
93. The waveform generator of claim 92, wherein the variable amplitude signal generator includes a digital to analog converter that converts digital representations of the amplitude of each of said plurality of RF waveforms to corresponding analog signals.
94. The waveform generator of claim 93, wherein the digital representations are quantized amplitude representations.
95. The waveform generator of claim 94, wherein the quantized amplitude representations are retrieved from a memory.
96. The waveform generator of claim 84, wherein the time spacing between each of said plurality of RF waveforms is substantially the same.
97. The waveform generator of claim 84, wherein the time spacing between each of said plurality of RF waveforms corresponds to a center frequency of the aggregate spectral energy of the plurality of RF waveforms.

98. The waveform generator of claim 84, wherein the width and shape of the desired envelope determines the bandwidth of each of a plurality of harmonics of the aggregate spectral energy of the plurality of RF waveforms.
99. The waveform generator of claim 84, wherein the filter limits the spectral energy to a harmonic of a plurality of harmonics of the aggregate spectral energy of the plurality of RF waveforms.
100. The waveform generator of claim 84, wherein the polarity of each of said plurality of RF waveforms is in accordance with a desired envelope.